

# The Testing Effect: Experimental Evidence from a College Course

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## Background

- The *testing effect* occurs when intervening tests (quizzes) on target material enhance performance on a later (final) test.
- Though the testing effect has been demonstrated in laboratory experiments (see Roediger & Karpicke, 2006a for a review), little research has examined whether the testing effect emerges in classroom settings.
- This study examines whether the testing effect can be generalized to the college classroom where there exists the significant potential for improving student learning.

## Methods

### Participants:

- Twenty-one incoming freshman at a mid-western university enrolled in a five-week Introduction to Psychology course.

### Design:

- 2 x 2 x 2 within-subjects design
  - Intervening test (quizzed, not quizzed)
  - Question stem (same worded, different worded)
  - Exam question type (multiple choice, short answer)

### Materials:

- Quizzes (12 short answer questions for each quiz)
  - 8 asked as multiple choice on exams (4 same worded; 4 different worded)
  - 4 asked as short answer on exams (2 same worded; 2 different worded)
- Exams (40-50 multiple choice, 16 short answer)
  - 16 multiple choice & 8 short answer previously quizzed by any group
  - 16 multiple choice & 8 short answer not quizzed but yoked to tested material

### Sample Items

*Quiz Same Stem:* What is the purpose of using a placebo in a drug experiment?

*Quiz Different Stem:* \_\_\_\_\_ are sometimes used in experiments to determine whether the drug has any effect beyond that produced by the subjects' own expectations.

*Exam multiple choice:* What is the purpose of using a placebo in a drug experiment?

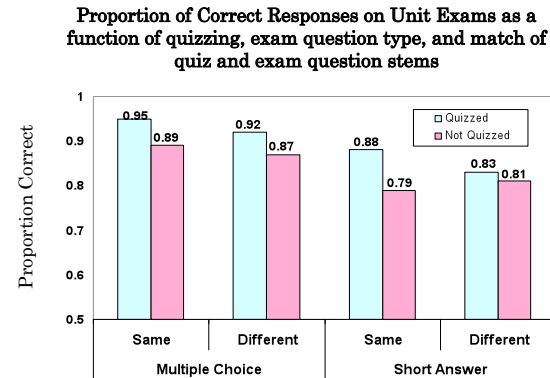
- To guard against possibly dangerous effects of the drug being tested
- To avoid giving the drug to someone who doesn't need it
- To determine whether the drug has any effect beyond that produced by the subjects' own expectations
- To reduce the random variability that naturally occurs in any behavioral test.

### Procedure:

- Subjects attended class 5 days/week for 1 hour 45 minutes per day. Quizzes were administered through email twice per week; subjects submitted answer through email and received immediate feedback. Unit exams were given during class once per week. Tested material was counterbalanced across 4 groups such that each particular group was exposed to ½ of the tested material.

## Results

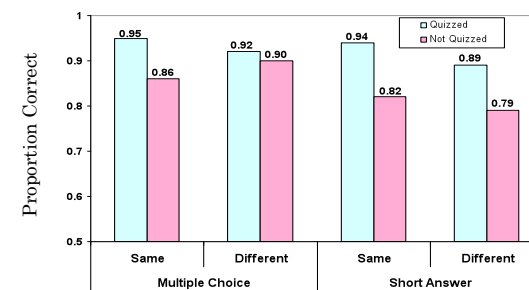
### Exam Performance:



**Figure 1.** Better exam performance for quizzed items: question stem interacts with exam question type for short answer, but not multiple choice.

### Effect of Feedback:

Proportion of correct items on the quizzes that were answered correctly on the unit exams compared to matched unquizzed items as a function of quizzing, question type, and match of quiz and exam question stems



**Figure 2.** Better exam performance for quizzed items regardless of question type and match of quiz and exam question stems.

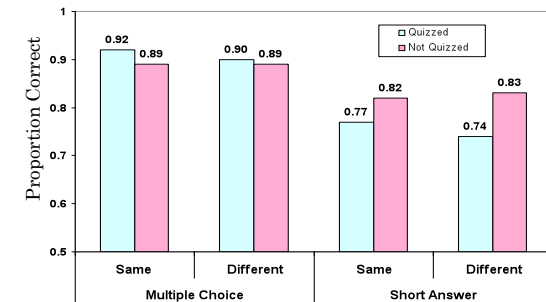
## References

- Roediger, H. L. III, & Karpicke, J. D. (2006a). The power of testing memory: Basic research and implications for educational practices. *Perspectives on Psychological Science*, 1, 181-210.

## Results

### Effect of Feedback:

Proportion of missed items on the quizzes that were answered correctly on the unit exams compared to matched unquizzed items as a function of quizzing, question type, and match of quiz and exam question stems



**Figure 3.** Significant interaction between quizzing and match of quiz and exam question stems: quizzing only slightly improved initially missed multiple choice question, while exam performance fared worse for initially missed short answer questions.

## Conclusions

- There was a testing effect.
- For **multiple choice exam** questions, there was a significant advantage of quizzing for both same and different stem questions.
- For short answer **exam** questions, there was a significant advantage of quizzing for same stem questions, but not for different stem questions.
- Questions answered correctly on the quizzes yielded significantly higher exam performance relative to unquizzed questions regardless of exam question type and question stem.
- For questions answered incorrectly on the quizzes, only **multiple choice** exam questions resulted in slightly better exam performance relative to nonquizzed items; for SA exam questions, quizzed items fared worse. Students may not process feedback administered through email.

## Acknowledgements

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